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MEMOIRS
OF THE
GEOLOGICAL SURVEY
OF
THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF
BRITISH ORGANIC REMAINS.

DECADE III.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE:
PUBLISHED BY
LONGMAN, BROWN, GREEN, AND LONGMANS.
1850.

NOTICE.

PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service.

The plan proposed to be followed in the work, of which this Decade forms a part, is as follows :—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the Maps and Memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,
Director-General.

*Geological Survey Office, Jermyn Street,
30th June, 1850.*

BRITISH FOSSILS.

DECADE THE THIRD.

THE third Decade of representations of British Fossils follows up the subject of the first, and continues the series of illustrations of the genera and species of extinct Echinodermata, especially those belonging to the orders *Asteriadae* and *Echinidae*.

The genera illustrated in this Decade are partly new, partly long-established ; so also with the species, some of the most remarkable of unpublished forms having been selected, as well as some of the commonest and best known fossils. Yet, even respecting those which are so familiar that their whole history is believed to have been long ago made out, there is so much to be cleared up, so many points of structure hitherto very imperfectly or not at all elucidated, and such an accumulation of synonyms, that their investigation is much more laborious, and occupies much longer time, than inquiries into entirely new types. Thus, three of the fossils figured and described in this Decade, *Hemicidaris intermedia*, *Galerites albogalerus*, and *Micraster cor-anguinum*, are so familiar to geologists and naturalists, so abundant and so well preserved, that authors do not hesitate to cite them without comment, as if they were free from any obscurity. Nevertheless, I may say confidently, that not until now has the literature of these well-known and often-described forms been cleared up, and many of the most important points in their organization made known. Common as they are, no representations of them, presenting sufficient details of their structure, have ever appeared before.

Among the new forms now first described and figured, some are of singular interest. Two of them, the *Lepidaster Grayii* and the *Tropidaster pectinatus*, are not only new as species, but unquestionably possess features entitling them to become the types of new genera. Of those

belonging to old genera, the *Uraster Gaveyi* is singularly interesting, presenting, as it does, the spectacle of a Liassic echinoderm, which so closely resembles the commonest star-fish now living in the British seas, that it can only be distinguished from it by a minute and critical comparison; and the *Hemicidaris Purbeckensis* is remarkable as being the first member of its tribe ever discovered in strata of the Purbeck series.

The species described and figured have been selected from formations of different geological epochs. From Silurian rocks *Lepidaster Grayii* has been taken; from older secondary strata, the two forms of *Hemicidaris*, the *Galerites (Holectypus) hemisphærica*, chosen on account of its being new to Britain, and also affording an excellent illustration of the sub-genus to which it belongs, and the *Dysaster ringens*, selected for the same reasons; also the new star-fishes, species of *Uraster* and *Tropidaster*, already alluded to. Of cretaceous fossils there are the critical *Galerites castaneus*, and the characteristic *Galerites albogalerus* and *Micraster cor-anguinum*.

A third series of illustrations of the fossil Echinoderms is far advanced, and in preparation for publication.

EDWARD FORBES.

June, 1850.

BRITISH FOSSILS.

DECADE III. PLATE X.

MICRASTER COR-ANGUINUM.

[Genus MICRASTER. AGASSIZ. (Sub-kingdom Radiata. Class Echinodermata. Order Echinidæ. Family Spatangaceæ.) Body cordate, tumid; dorsal ambulacra narrowly petaloid, not circumscribed by a peripetal band; dorsal surface studded with uniform small tubercles, no large primaries; anus terminal, supra-marginal; caudal (infra-anal) extremity circumscribed by a band.]

DIAGNOSIS. *M. ambitu cordato, dorso convexo, postice arcuato; ambulacris dorsalibus impressis, sulcis porarum terminalium vix decrescentibus; assulis arearum ambulacralium dorsalium tumidis, subtuberculatis.*

FORMA α . *Normalis, regulariter cordatus, dorso vertice subcentrali; genis tumidis. Spatangus cor-anguinum a. anglicum*, LESKE, ap. Klein, p. 28, tab. 23, A, B. *Echinus cor-anguinum*, GMELIN, 3195. *Spatangus cor-anguinum* and *punctatus*. *Ananchytes spatangus* and *semiglobosus*, LAMARCK, An. sans Vert. iii., pp. 26 and 32. *Spatangus cor-anguinum*, ALEX. BRONGNIART, Desc. Geol. des Env. de Paris, pl. 4, fig. 11. *Spatangus cor-marinum*, PARKINSON, Org. Rem. iii., pl. 3, fig. 11. *Spatangus cor-anguinum*, GOLDFUSS, Pet. Germ., pl. 48, fig. 6; and *Spatangus cor-testudinarium*, ibid., pl. 48, fig. 5. *Micraster cor-anguinum*, AGASSIZ and DESOR, Cat. Rais., in Ann. des Sc. Nat., 3rd series, tome viii., p. 23. *Micraster cor-testudinarium*, BRONN, Lethæa, pl. 29, fig. 23.

FORMA β . *Rostratus, regulariter cordatus, dorso carinato, vertice in areâ anali, genis tumidis. Ananchytes cordata*, LAMARCK, An. sans Vert. iii. *Spatangus rostratus*, MANTELL, Geol. Suss., pl. 17, figs. 10, 12; WOODWARD, Geol. Norf., pl. 5, fig. 7. *Micraster cordatus*, AGASSIZ, Cat. Syst., 2; and Cat. Rais. des Ech., p. 23.

FORMA γ . *Gibbus, late cordatus, dorso vertice centrali, postice anticeque declivente, genis compressis.*

VAR. *a. pyramidata. Spatangus gibbus*, LAMARCK, Anim. sans Vert. iii., fig. in Ench. Meth., pl. 156, figs. 4-6. *Micraster gibbus*, AGASSIZ and DESOR, Cat. Rais. des Echin. Ann. des Sc. Nat., 3rd ser., tome viii., p. 24; FORBES, in Dixon's Sussex, p. 342, pl. 24, fig. 314.

VAR. *b. tumidior*. *Spatangus gibbus*, GOLDFUSS, Pet. Germ., p. 156, pl. 48, fig. 4. *Spatangus cor-anguinum*, WOODWARD, Geol. Norf., pl. 5, fig. 8. *Micraster gibbus*, AGASSIZ, Cat. Syst., p. 2; E. SISMONDA, Mem. Ech. Foss. Nizza, p. 23. *Micraster brevis*, DESOR, Cat. Rais. des Echin. Ann. des Sc. Nat., 3rd ser., tom. viii., p. 24.

The first illustration of the genus *MICRASTER* selected for these Decades is one of our commonest cretaceous Echinidæ. It is chosen partly because the perfection and abundance of specimens permit of its structure being described and delineated more in detail than that of any of its congeners, and partly since, common as it is, nevertheless, like most common fossils, it requires a much more critical examination than it has yet undergone.

It has been figured and described, according to their fashion, by many of the older writers on fossils. Llhwyd, Hook, Breyn, Schlotheim, Walch, Morton, Klein, Davila, Van Phelsum, and Leske have severally represented and commented upon it. Very variable in its features, unless we have many specimens before us, we can scarcely put two or three examples together which are closely alike in proportions. This capacity for variation has caused many spurious species to be constructed out of one.

It is the type of the genus *Micraster* of Agassiz. That genus is distinguished among the other *Spatangaceæ* with petaloid ambulacra, from *Spatangus* and its allies, by its surface being covered with secondary tubercles only, and by its rather narrow ambulacra, not bounded by or including a fasciole of tertiary spines; by the presence of a sub-anal fasciole from *Brissus* and *Amphidetus*.

The outline of the body is always cordate, in most specimens nearly as broad on the widest part as long, sometimes broader than long—rarely much longer than broad. The greatest width of the lateral outline is invariably a little behind the antero-lateral ambulacral plates; from that point to the anal extremity it describes a regular and considerable curve in all the varieties. The dorsal surface varies from an almost conical convexity (extreme form of *Spatangus gibbus*, Lamarck) to depressed, as seen in the larger variety of the typical *cor-anguinum*. When very conical and compressed, then the highest part, or vertex, is at the apex, or ovarian, disk of the shell; in the depressed form it is a little behind this disk; in the rostrated form it is behind this disk, nearly in the centre of the posterior interambulacral area. The anterior half of the back varies in degree of declivity in all the forms, but is especially steep in the extreme form of *gibbus*, and in a not uncommon variation of *rostratus*. Intermediate specimens, exhibiting every degree of tumidity of the cheeks (or swelling on each side of the odd ambulacrum) are common. As a general rule, the cheeks are tumid. The posterior half

of the back varies greatly in declivity in the several varieties ; the posterior interambulacral space declining in one set of forms, becoming elevated in another ; the former being the *gibbus* of Lamarck and the variety figured under the same name by Goldfuss, the latter being the *rostratus* of Mantell, *cordatus* of Lamarck. But whether declining or elevated, the outline of the posterior interambulacral space is always an arcuated curve. According to its elevation, so is the altitude of the anus on the truncated posterior extremity. This aperture is circular, occupying a depression bounded by a narrow and defined circle of smooth-edged plates. The surface below it is flattened or slightly hollowed out, the bounds of the depression corresponding to two terminal bosses or caudal projections, which in the living animal doubtless bore two projecting tufts of long spines. These caudal projections are included within the sub-anal circumscribed space ; the circumscription (which in specimens of this species is not always conspicuously manifest) is transversely oblong and inclined to quadrate. The ventral surface is slightly tumid, but sometimes nearly flat centrally. The mouth is placed very near the anterior extremity, at the inferior termination of the deeply impressed anterior ambulacrum. It varies slightly in position in different specimens. Its projecting lip is strong and thickened, and varies in degree of projection.

The dorsal ambulacra, or rather stellate portions of them, are through a great part of the length of them parallel-sided, not contracting much towards their lower extremities, so that their form is oblong-lanceolate, and but slightly petaloid. They are all, throughout the greater part of their length, placed in depressions of different degrees of depth in different examples ; sometimes very shallow, and the ambulacra almost on a level with the surface, especially in young specimens. The anterior or odd one is very variable in its degree of development, and differs from the others—its ambulacral area simply granulated, without tumidity of the separate plates : in many examples the grooves connecting its pores are obsolete. The lateral ambulacra vary greatly in length in different specimens and varieties : the antero-laterals are always longer than the postero-laterals, sometimes considerably so. The latter are longest in the conical forms of the species, but the relative length of these ambulacra cannot be taken as a specific character, nor can the number of the pairs of pores in them, seeing that almost every specimen varies in this respect, as may be seen by comparing the enumeration in the table given hereafter. The lateral ambulacra, however, in other points exhibit excellent characters, constant throughout all the individuals of every variety of the species. Their ambulacral plates are invariably tumid, rugose, and separated by a strongly marked suture, whilst the general suture running down the centre of the ambulacral area is deeply depressed and groove-like. The ridge

separating each poriferous groove is also tumid and studded with a single row of conspicuous close-set tubercles, usually five or six in each series.

The genital disk is composed of four developed genital plates, each with an oviducal hole. The postea or fifth plate is undeveloped. The left antero-lateral is much larger than the others; in its upper portion, which occupies the centre of the disk, it is minutely punctated, forming the madreporiform body. The eye-plates are all five developed and perforated.

The whole of the dorsal and lateral plates are minutely granulated and studded in a scattered manner with small, nearly equal spiniferous tubercles, each consisting of a perforated tubercle placed on a crenulated base, and surrounded by a smooth ring. They become much more closely set on the lower parts of the side, and are much larger on the ventral surface of the body, and regularly arranged on the ovate, acute post-oral spinous space, but are few on the ambulacral plates bounding that area. The ambulacral pores radiating from the mouth are lodged in short inconspicuous rather rugose grooves. The sutures of the plates below and near the anus are edged with minute granules arranged in rows.

The spines are rarely seen, and have never before been represented, nor, I believe, described. They are very slender and small; not, however, all minute, for some are as much as a quarter of an inch in length, and were possibly longer. They are mostly arcuated near the base, ridged along their length by about six ribs, which in some specimens appear to be rugose with prickly-like projections apparently arranged spirally, thickened suddenly at their bases, where they are surrounded by a strongly crenulated ring. The habits of the animal, as indicated by these spines, probably resembled those of the existing sea-urchins of the genus *Brissus*.

Very young specimens are mostly of a more elongated form than is seen, except rarely, in the adult; but there are also tumid young ones, and it is possible that the sub-depressed and tumid forms of this species (*cor-anguinum* and *rostratus*), both of which are common and found together, may be male and female individuals respectively.

Flint-casts of the interior of this urchin are not uncommon, and when in fine condition serve beautifully to illustrate the arrangement of the plates. The anterior and lateral interambulacral segments of the body, although very unlike, are formed of about twelve pairs of plates in each compartment. Those of the anterior segment gradually increase in dimensions as they approach the wider and lower portion of the cheeks; those of the lateral compartments are unsymmetrically unequal, and the lower or ventral ones assume irregular polygonal shapes with increased size, in order to fill up the triangular sides of the oral

surface. The odd or posterior interambulacral area has the plates considerably distorted by the position of the vent. Those above it increase gradually, and are about six or seven in number. From four to six bound the sides and the lower margin of the vent, and three pair fill up the sub-anal region as far below as the base of the post-oral spinous space, which is composed of a pair of large triangular plates with curved outer sides. The number and arrangement of the interambulacral plates does not seem to differ much in any of the varieties, but the number of the ambulacrals differs in every specimen which is not exactly similar to some other. In a cast of the form *cor-testudinarium* the number of pairs of pores in the anterior ambulacrum was (petaloid region) 12 + (plane region) 15; in the antero-laterals (petaloid region) 25 + (plane region) 15; in the postero-laterals 19 + (plane region) 16 + (ventral region) 5. In a cast of the *gibbus* form, the respective numbers ranged in the same order were—

Anterior ambulacrum . .	22 + 12
Antero-lateral ditto . . .	35 + 19
Postero-lateral ditto . . .	30 + 17 + 5.

Flint-casts often show very clearly the arrangement of the oviducal pores and eyes. The number of pairs of pores increases with age.

In the following table I have contrasted the dimensions and numbers of pair of pores in the dorsal ambulacra of twelve adult specimens taken from among all the chief varieties. It will be seen that these characters are very variable, and not sufficient to warrant specific distinction.

Variety, and Number of Specimen in Survey Collection.	Length.	Breadth.	Height.	Number of Pores in a row in each Antero- lateral Avenue.	Number of Pores in a row in each Postero- lateral Avenue.	Number of Pores in a row in the Anterior Ambula- crum.
	Inches.	Inches.	Inches.			
1. γ . Extreme form, "Gib- bus" of Lamarck	3	3	3	46	37	28
2. γ . Extreme but small form	$2\frac{4}{12}$	$2\frac{4}{12}$	$1\frac{1}{2}$	43	30	22
3. γ . Ditto	$1\frac{11}{12}$	2	$1\frac{7}{12}$	36	34	25
4. γ . "Gibbus" of Goldfuss	$1\frac{1}{12}$	$2\frac{1}{12}$	$1\frac{3}{12}$	36	31	. .
5. γ . Ditto	$1\frac{7}{12}$	$1\frac{9}{12}$	$1\frac{3}{12}$	33	25	18
6. Inter γ and β , nearer γ	2	$2\frac{1}{12}$	$1\frac{1}{2}$	31	21	19
7. Inter α and γ	$1\frac{11}{12}$	2	$1\frac{3}{12}$	29	21	20
8. α . Tumid form	2	2	$1\frac{4}{12}$	27	22	20
9. α . Depressed	$2\frac{5}{12}$	$2\frac{4}{12}$	$1\frac{3}{12}$	32	28	20
10. α . Ditto	$2\frac{2}{12}$	$2\frac{2}{12}$	$1\frac{3}{12}$	34	24	20
11. β . Rostrated	$2\frac{2}{12}$	$2\frac{2}{12}$	$1\frac{1}{2}$	34	25	18
12. β . Ditto	2	2	$1\frac{4}{12}$	31	22	22

The very great variation of outline, tumidity, and consequent arrangement of the ambulacra, have caused this *Micraster* to be split up into numerous spurious species. But in the collections of the Geological Survey, and in many private collections, especially those of Mr. Bowerbank and Mr. Wetherell, where extensive suites of specimens are assembled, and intermediate forms as carefully preserved as extreme ones, it becomes very manifest that all resolve themselves into one species, sufficiently marked by constant characters common to all the individuals. I have grouped them under three conspicuous types—*normalis*, *rostratus*, and *gibbus*; but as the variations of each of these have been honoured by not a few palæontologists with specific rank, I think it best to enumerate all the forms which have been so distinguished.

A. "*Species*" constructed out of the *Normal form*.

1. *Cor-anguinum*, Auctorum. The old figures in Leske's edition of Klein (tab. xxiii., figs. A, B, C, D), are bad representations of the ordinary aspect of what is placed in collections under this name. The figure of *cor-anguinum*, Goldfuss (Pet. Germ., tab. xlviii., fig. 6), is perhaps the best representation of one of the most common varieties of what is regarded as this species by all authors. Parkinson's *Spatangus cor-marinum* (Org. Rem., iii., pl. 3, fig. 11), represents a specimen with deeper ambulacra than usual. The *cor-anguinum* of Woodward's "Geology of Norfolk" is var. *gibbus*.

2. *Spatangus cor-testudinarium*. Goldfuss (tab. xlviii., fig. 5); *Micraster cor-testudinarium* of Agassiz (Cat. Syst.); but more lately (in the Catalogue Raisonné) considered by Agassiz and Desor as "var. *lata*" of their restricted *Micraster cor-anguinum*. This is only a very slight variety of the normal form, constructed out of such specimens as have the mouth slightly further back than usual, a feature not unfrequently seen in depressed specimens. According to Agassiz, the name "*Spatangus anticus*" of DeFrance applies to this form.

3. *Micraster arenatus* of Agassiz (Cat. Syst.), since referred by Agassiz and Desor to their variety "*major*" of their *cor-anguinum*, to which variety they refer the figure and description of "*Micraster arenatus*," in E. Sismonda's "Memoria sugli Echinidi Fossili del contrado di Nizza" (p. 28, tab. i., fig. 2). In the plate in question, however, no profile of this urchin is given, and the description of the elevation of the back, would seem rather to indicate a variety of the *gibbus* or *rostratus* types. F. A. Roemer, in his "Versteinerungen des Nord-deutschen Kreidegebirges," identifies *arenatus* with "*rostratus*."

4. *Micraster Michelinii* of Agassiz (in the Catalogue Raisonné). This is the *cor-anguinum* of Agassiz, in his "Description des Echinodermes Fossiles de la Suisse" (tab. iii., figs. 14, 15); in which work he identifies it with the *cor-anguinum* of previous authors. In his later

catalogue he remarks on it—"Forme intermediaire entre le *M. cor-anguinum* et le *M. acutus*. Les ambulacraires sont dans des sillons plus profonds et plus larges." His figure is a very good representation of a very ordinary and normal specimen of *cor-anguinum*. Sismonda has cited it also as such without, any more than myself, seeing peculiarities in it.

5. *Spatangus punctatus*, Lamarck. The figure (tab. xvii.* c.) of Leske, referred to as representing this species, is an ordinary but large specimen of the normal form; and we are assured by Agassiz (Echin. Suisse, i. p. 25) that his examination of Lamarck's original specimens convinced him that this, and

6. *Ananchytes semiglobosus*, Lamarck, and

7. *Ananchytes spatangus*, Lamarck, are all specimens of *cor-anguinum*. The true structure of *Ananchytes*, as contrasted with *Spatangus* and *Micraster*, was not understood by Lamarck, whose examination of the Echinidæ generally is extremely superficial.

8. *Spatangus acutus*, Deshayes (Coq. Caract. des Terr., tab. xi., figs. 5 and 6), is regarded by Agassiz and Desor as a distinct species. Judging from the figure, it appears to be a specimen of the normal form of *cor-anguinum*, in which the caudal extremity is slightly more produced than usual, a variation not uncommon.

B. "*Species*" constructed out of the *Rostrated form*.

9. *Ananchytes cordatus*, Lamarck. *Micraster cordatus*, Agassiz and Desor. Regarded as distinct also by E. Sismondi. Identical with this is

10. *Spatangus rostratus*, Mantell; and, according to Agassiz and Desor,

11. *Spatangus Requiemi*,

12. *Scutella pyramidalis*, Risso; and

13. *Spatangus bituricensis*, Defrance.

C. "*Species*" constructed out of the *Gibbous form*.

14. *Spatangus gibbus*, Lamarck. *Micraster gibbus* of Agassiz and Desor, but not of the Catalogue Systématique. The figures in the Encyclopédie Méthodique (pl. clvi., figs. 4, 5, 6) represent this pseudo-species, which, however, has a far more specific aspect than any of the other varieties. Such extreme examples occasionally occur in England, but are rare. The great development of the postero-lateral ambulacra, resulting from the great elevation of the apex and the low position of the vent, seems, at first, a sufficient distinction, but this character varies much, passes distinctly into the variety next to be named, and through it into more normal types.

15. *Micraster brevis*, Desor; the *Spatangus gibbus* of Goldfuss, *Micraster gibbus* of Agassiz (Cat. Syst.) The intermediate form between No. 14, and more ordinary varieties. It is not uncommon in England,

and graduates very gently into 14 on the one side, and the normal *cor-anguinum* on the other.

Agassiz and Desor (whose declaration that forms are specifically identical is pretty good warrant for considering them undistinguishable) identify with this form

16. *Spatangus ananchytoides*, Desmoulin, and, 17, *Micraster latus*, Agassiz (Cat. Syst.) and Sismonda, whose figure represents the specimen only from above. It is fair to say that the Italian author, in the "Memoir on the Fossil Urchins of Nice," distinguishes his *latus* from *gibbus*, referring the latter name to both Lamarck and Goldfuss. He inserts Risso's *Spatangus sub-alpinus* as a doubtful synonym of *latus*. From the view which Sismonda, in the very excellent memoir cited, one of the best papers on fossil Echinoderms with which I am acquainted, takes of the specific distinctions of *Micrasters*, in all probability his *latus* should claim only to rank as a sub-variety under the form *gibbus* of *cor-anguinum*.

Thus seventeen forms, at fewest,—I fear more might be added,—have been at different times regarded as distinct species; all of which appear to be variations (many not even so much) of a single specific type. In the "Catalogue Raisonné des Echinides" the authors hold out of the number, six specific types of *Micraster*, viz., *cor-anguinum*, *Michelini*, *acutus*, *cordatus*, *brevis*, and *gibbus*. But how *acutus* and *Michelini* are to be separated from *cor-anguinum* it is difficult to understand; whilst that *cordatus* (better known in England under the name of *rostratus*) is a variety of *cor-anguinum*, few collectors even will be inclined to dispute. As to the form called *brevis*, it is constantly regarded in England as a variety of *cor-anguinum*, and most certainly, as I have already said, passes into the normal type on the one hand, and into the extreme *gibbus* on the other, by almost imperceptible gradations.

British Localities and Geological Range.—CHALK. It is found in all the chalk districts of England; abundantly in many counties, as in Kent, Sussex, and Norfolk. Its geological position is usually in the upper chalk; it is recorded also from the lower chalk of Pinhay and Charlton. The normal and rostrated forms are most common; the sub-gibbous variety is next, and the extreme gibbous one rarest. Portlock records it from the chalk of Magilligan, county Derry, in Ireland.

It is said to occur in the green-sand of Devon, but this is probably a mistake.

Foreign Distribution —In the chalk of France, Germany, Switzerland. Sismonda finds it in the marly chalk in the neighbourhood of Nice. Agassiz records the sub-gibbous variety from the chalk marl of Normandy, &c.; from the "Craie chloritée of Coudrecieux (Sarthe);" and from the chalk with Hippurites of Nice.

DESCRIPTION OF THE PLATE.

- Fig. 1. Specimen of the form β seen from above.
 Fig. 2. The same from below.
 Fig. 3. The same, posterior view.
 Fig. 4. The same, lateral view.
 Fig. 5. Ambulacral and interambulacral plates, showing the termination of the dorsal petals of one of the lateral ambulacra.
 Fig. 6. Spiniferous tubercles of dorsal interambulacral plates.
 Fig. 7. Ditto of ventral plates.
 Fig. 8. Base of one of the straight spines, greatly magnified.
 Fig. 9. Outline of a young specimen of the elongated form (in Mr. Bowerbank's collection.)
 Fig. 10. Outline profile of the normal form.
 Fig. 11. Outline profile of the gibbous form (in Mr. Bowerbank's collection.)
 Fig. 12. Ditto of the sub-gibbous form.
 Fig. 13. Granulation and tumidity of the ambulacral plates of the petaloid portion of the dorsal ambulacra (highly magnified). This is the distinctive character of the species.
 Fig. 14. A spine from near the anal region, figured from a specimen in Mr. Bowerbank's collection: the spatulate extremity is shown by its side.
 Fig. 15. A portion of a spine, exhibiting a spirally rugose structure.

Note on Allied British Species.

Mr. Morris, in his valuable "Catalogue of British Fossils" (1843), enumerates ten species of *Micraster*. Since the publication of that work the Brissoid species of the group, as then received, have been separated very properly by Agassiz. Only four of the names there given, consequently, fall strictly under *Micraster*; viz., *cor-anguinum*, *cor-testudinarium*, *gibbus* (for which both Lamarck and Goldfuss are cited), and *rostratus*. All of them are here regarded as varieties of one species, viz., *Micraster cor-anguinum*.

There is, however, a *Micraster* found in our British chalk, which is very distinct from *cor-anguinum*, and which does not appear to belong to any of the described species of foreign authors. I have given an account of it in Mr. Dixon's work on the Geology of Sussex, where it is excellently figured. I have there named it *Micraster cor-bovis*. It is usually a larger and longer species than *cor-anguinum*, and its petaloid ambulacra are more deeply impressed and much shorter in proportion to the body. The shape is ovato-cordate, the curve of the sides from the front of the antero-lateral ambulacra to the anal extremity being but slight, its chief swelling being near the anus, and not on a line with the end of the postero-lateral ambulacra, as in *cor-anguinum*. The back is more equally depressed than in the depressed variety of the last-named species. The mouth is much smaller comparatively, and the post-oral spinous space, though much longer, in consequence of the elongation of the hinder portion of the test, is nevertheless proportionally broader. The tubercles of the plates, whether dorsal or ventral, are much smaller and more scattered. Besides all these comparative characters, there is the positive one that in *cor-bovis* the ambulacral plates, instead of being tumid are smooth and plane, as are also the ridges separating the sulcations of the pairs of pores in the petaloid ambulacra. The ambulacral spaces are wider than the breadth of any of the sulcations. As contrasted with *Cor-anguinum*, the diagnosis of *cor-bovis* would stand thus:—

M. ambitu ovato-cordato, dorso convexiusculo, postice leviter arcuato, elongato; ambulacris dorsalibus impressis, assulis arearum ambulacralium dorsalium planis, lævigatis.

I have seen specimens of this species, which attain a length of 3 inches by $2\frac{1}{2}$ at its broadest part, and a height of 1 inch $\frac{1}{2}$, in the collection of the lamented Mr. Dixon of Worthing, who had it from Sussex; in Mr. Bowerbank's collection; and in the Museum of the Geological Society, where there are specimens from Charing, Kent, presented by Mr. W. Harris, and from Hemel Hempstead, presented by Mr. H. C. White.

In Mr. Bowerbank's collection there are specimens, unfortunately not in sufficiently good condition, of a small *Micraster*, with a very elevated extremity, from the lower chalk of Lyme, which is possibly a distinct species.

EDWARD FORBES.

June, 1850.

ERRATUM.

DECADE IV. PLATE X.

For CARDIASTER CAUDATUS *read* CARDIASTER ROSTRATUS.

